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(54) Spiral base structures for long nip paper machine press belts

Spiralformiges Armierungsband für Pressbänder zum Einsatz in Langspaltpresse

Structure de base en hélice pour des bandes pour presse à pinçage prolongé

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Description

[0001] The present invention relates to mechanisms for extracting water from a web of material, and more particularly from a fibrous web being processed into a paper product on a papermaking machine. Specifically, the present invention relates to an impermeable belt designed for use in conjunction with a long nip press on a papermaking machine, and to a method for making the impermeable belt.

[0002] During the papermaking process, a fibrous web is formed on a forming wire by depositing a fibrous slurry thereon. A large amount of water is drained from the slurry during this process, after which the newly formed web proceeds to a press section. The press section includes a series of press nips, in which the fibrous web is subjected to compressive forces designed to remove water therefrom. The web finally proceeds to a drying section which includes heated dryer drums around which the web is directed. The heated dryer drums reduce the water content of the web to a desirable level through evaporation.

[0003] Rising energy costs have made it increasingly desirable to remove as much water as possible from the web prior to its entering the dryer section. The dryer drums are often heated from within by steam and related costs can be substantial especially when a large amount of water needs to be removed from the web.

[0004] Traditionally, press sections have included a series of nips formed by pairs of adjacent cylindrical press rolls. In recent years, the use of long press nips has been found to be advantageous over the use of nips formed by pairs of adjacent press rolls. The longer the time a web can be subjected to pressure in the nip, the more water can be removed there, and, consequently, the less water will remain behind in the web for removal through evaporation in the dryer section.

[0005] The present invention relates to long nip presses of the shoe type. In this variety of long nip press, the nip is formed between a cylindrical press roll and an arcuate pressure shoe. The latter has a cylindrically concave surface having a radius of curvature close to that of the cylindrical press roll. When the roll and shoe are brought into close physical proximity to one another, a nip is formed which can be five to ten times longer in the machine direction than one formed between two press rolls. This increases the so-called dwell time of the fibrous web in the long nip while maintaining the same level of pressure per square inch in pressing force used in a two-roll press. The result of this new long nip technology has been a dramatic increase in dewatering of the fibrous web in the long nip when compared to conventional nips on paper machines.

[0006] A long nip press of the shoe type requires a special belt, such as that shown in US-A-5238537. This belt is designed to protect the press fabric supporting, carrying and dewatering the fibrous web from the accelerated wear that would result from direct, sliding contact over the stationary pressure shoe. Such a belt must be provided with a smooth, impervious surface that rides, or slides, over the stationary shoe on a lubricating film of oil. The belt moves through the nip at roughly the same speed as the press fabric, thereby subjecting the press fabric to minimal amounts of rubbing against the surface of the belt.

[0007] Belts of the variety shown in US-A-5238537 are made by impregnating a woven base fabric, which takes the form of an endless loop, with a synthetic polymeric resin. Preferably, the resin forms a coating of some predetermined thickness at least on the inner surface of the belt, so that the yarns from which the base fabric is woven may be protected from direct contact with the arcuate pressure shoe component of the long nip press. It is specifically this coating which must have a smooth, impervious surface to slide readily over the lubricated shoe and to prevent any of the lubricating oil from penetrating the structure of the belt to contaminate the press fabric, or fabrics, and fibrous web.

[0008] Long nip press belts, such as that shown in US-A-5238537, depending on the size requirements of the long nip presses on which they are installed, have dimensions of length from 3 to 12m (10 to 40 feet), measured longitudinally around its endless-loop form, and of width from 2.5 to 11.4m (100 to 450 inches), measured transversely across. Whether its woven base fabric is flat-woven, and subsequently seamed into endless form, or is woven endless in tubular form, large weaving looms are required for their production. In either case, the weaving process is a time-consuming and cumbersome operation, as the woven base fabric must have the same dimensions as the finished long nip press belt.

[0009] EP-A-0 538 211 discloses a method for manufacturing long nip press belts of varying transverse and longitudinal dimensions, which does not require the provision of an endless base fabric in the dimensions required for a specific long nip press. In EP-A-0 538 211, the belt is constructed from an elongated strip comprising a reinforcing web previously coated with first and second polymeric resin coatings, and the elongated strip is wound into the form of a closed helix to form the long nip press belt. The edges of adjacent coils may be joined together in various overlapping arrangements, and secured with an adhesive, to provide the impermeable belt.

[0010] The present invention provides a further solution to the above mentioned problem in the form of a spiral base fabric, which may comprise, for example, a plurality of spirally wound and joined turns of a relatively narrow woven fabric, which base fabric may be used as an endless base fabric for a long nip press belt.

[0011] The present invention relates to a belt for use on a long nip press of the shoe type for dewatering a fibrous web, said belt comprising:

a base comprising a spirally wound prepared structure strip, said strip having a width smaller than a

width of said base, said base being a plurality of non-overlapping turns of said spirally wound prepared structure strip, adjacent non-overlapping turns of said spirally wound prepared structure strip being abutted against one another and joined to one another, said base thereby having the form of an endless loop with an inner surface, an outer surface, a longitudinal direction and a transverse direction; and

a coating of a polymeric resin on at least one of said inner and outer surfaces of said base, said coating impregnating and rendering said base impervious to liquids, said coating being smooth and providing said belt with a uniform thickness.

[0012] The present invention further provides a papermaking machine including a long nip press provided with a belt as specified above.

[0013] In addition, the present invention provides a method for manufacturing a belt for a long nip press for dewatering a fibrous web comprising the steps of:

(a) manufacturing a prepared structure strip having a preselected width;

(b) spirally winding said prepared structure strip in a plurality of non-overlapping turns;

(c) abutting each turn of said prepared structure strip against that previously wound;

(d) joining each turn of said prepared structure strip to that previously wound to form a base of width greater than said preselected width of said prepared structure strip to provide a base in the form of an endless loop having an inner surface, an outer surface, a longitudinal direction and a transverse direction;

(e) coating at least one of said inner and outer surfaces of said base with a polymeric resin to cover said base and to form a layer of said polymeric resin thereon to provide said belt with a desired thickness; and

(f) curing said polymeric resin.

[0014] Accordingly, the present invention relates to a belt for use on a long nip press for dewatering a fibrous web, a papermaking machine including such a belt, and a method for manufacturing the belt. The belt comprises a base assembled by spirally winding a prepared structure strip, for example, around two parallel rolls. The prepared structure strip may be a fabric strip woven from lengthwise and crosswise yarns and has a smaller width than the width of the base as a whole.

[0015] The base is a plurality of non-overlapping turns of the spirally wound prepared structure strip. Adjacent turns are abutted against one another and joined together, preferably, by stitching or bonding. The base so produced has the form of an endless loop with an inner surface, an outer surface, a longitudinal direction, and a transverse direction.

[0016] Where the prepared structure strip is a woven fabric strip spirally wound to produce a woven base fabric, the lengthwise and crosswise yarns of the fabric strip do not align with the longitudinal and transverse directions of the woven base fabric, respectively, the latter being taken with reference to the endless loop form of the woven base fabric. Indeed the lengthwise yarns of the spirally wound fabric strip are inclined at an angle with respect to the longitudinal direction of the woven base fabric. The angle, typically small, is a measure of the pitch of the spiral winding.

[0017] In general, the lateral edges of the base, following assembly from the spirally wound prepared structure strip, require trimming to be made parallel to the longitudinal direction thereof.

[0018] A coating of a polymeric resin is provided on at least one of said inner and outer surfaces of the base. The coating renders the base impervious to liquids, and is smooth and provides the belt with a uniform thickness. The coating impregnates the base, where the base is a fabric, and, in general, is preferably ground and buffed to provide the belt with a smooth surface and a uniform thickness.

[0019] The method for manufacturing the belt comprises the step of manufacturing a suitable prepared structure strip. Where the prepared structure strip is a woven fabric strip, it is woven from lengthwise and crosswise yarns in a preselected width. Preferably, the woven fabric strip is heat-set following its manufacture by weaving, and accumulated on a stock roll for later use.

[0020] The fabric strip is then wound, for example, around two parallel rolls, in a plurality of non-overlapping turns to assemble a woven base fabric. Each turn is abutted against those adjacent thereto, and joined therewith, preferably by stitching or bonding. A woven base fabric, having an inner surface, an outer surface, a longitudinal direction and a transverse direction is the result. The lateral edges of the woven base fabric are then preferably trimmed, as discussed above, to render them parallel to the longitudinal direction of the woven base fabric.

[0021] Alternatively, the prepared structure strip may be a non-woven fabric strip, a perforated synthetic strip, or a polymeric film strip. By a non-woven fabric is meant a fibre structure produced by means other than weaving. Examples are spun-bonded fibre structures and fibre structures whose component fibres are bonded together at their crossover points by heat. Generally, these fibre structures are made from thermoplastic materials. The non-woven fabric may also be a needle-punched fibre structure.

[0022] The perforated synthetic strip may be a sheet of nylon extruded film or polyester film, either of which could be spirally wound and bonded. The strip can be perforated after extrusion in any of a number of patterns. Examples are round holes, square holes, chevron-shaped holes and diamond-shaped holes.

[0023] The polymeric film strip may be identical to the perforated synthetic strip except that it lacks perforations.

[0024] In each case, the prepared structure strip is spirally wound, and each turn of the spiral winding thereof joined to those adjacent thereto, preferably by stitching or bonding in the manner described above to produce the base. The bonding methods may be mechanical in nature, for example, butt sewing or fibre entanglement. Such methods could be used where the prepared structure strip is either a woven or a non-woven fabric strip. Ultrasonic welding and heat fusion could be used with any of the varieties of prepared structure strip. Chemical bonding could also be used with any of the prepared structure strips.

[0025] At least one of the inner and outer surfaces of the base is then coated with a polymeric resin to cover the base and to form a layer of the polymeric resin on the chosen surface, providing the belt with a desired thickness.

[0026] The polymeric resin is then cured, and, preferably, ground and buffed to provide the belt with a smooth surface and a uniform thickness.

[0027] The present invention permits the use of a relatively narrow piece of prepared structure strip to create a large endless base by spiralling the narrow piece and, for example, by stitching or bonding the lateral edges of adjacent turns of the spiral together along the continuous spiral seam thus formed. A loom as narrow as 5cm (2 inches) could be used to produce a prepared structure strip in the form of a woven fabric strip, but, for reasons of practicality, a conventional textile loom having a width from 1.5 to 3m (60 to 120 inches) may be preferred.

[0028] In any event, it will be recognised that endless bases of a variety of widths and lengths may be provided by spirally winding a relatively narrow piece of prepared structure strip around two parallel rolls, the length of a particular endless base being determined by the separation between the two parallel rolls, and the width being determined by the number of spiral turns of the prepared structure strip. The current necessity of manufacturing complete bases of specified lengths and widths to order may thereby be avoided.

[0029] Various embodiments of the present invention will now be described, by way of example only, with reference being made to the accompanying figures, which are listed and identified as follows:

Figure 1 is a side elevational view of a long press nip for which a belt according to the present invention is intended;

Figure 2 is a partially sectioned front view of the press nip shown in Figure 1;

Figure 3 is a perspective view of an apparatus used for assembling a woven base fabric of a belt according to the present invention;

Figure 4 is a top plan view of the same apparatus;

Figure 5 is a top plan view of the finished woven base fabric;

Figure 6 is a perspective view of the belt, as constructed in accordance with the present invention;

Figure 7 is a cross-sectional view of the belt taken as indicated by line 7-7 in Figure 6; and,

Figure 8 is a perspective view of an alternative belt embodying the present invention.

[0030] A long nip press for dewatering a fibrous web being processed into a paper product on a paper machine is shown in Figures 1 and 2. The press nip 10 is defined by a smooth cylindrical press roll 12, an arcuate pressure shoe 14, and a belt 16 constructed according to the present invention and arranged such that it bears against the surface of the cylindrical press roll 12. The arcuate pressure shoe 14 has about the same radius of curvature as the cylindrical press roll 12. The distance between the cylindrical press roll 12 and the arcuate pressure shoe 14 may be adjusted by means of conventional hydraulic or mechanical apparatus, which is not shown, connected to rod 18 pivotally secured to arcuate pressure shoe 14. The rod 18 may also be actuated to apply the desired pressure to the arcuate pressure shoe 14. It will be appreciated that the cylindrical press roll 12 and the arcuate pressure shoe 14 described above and shown in Figures 1 and 2 are conventional in the art.

[0031] A first papermaker's wet press fabric 20, a second papermaker's wet press fabric 22, and a fibrous web 24 being processed into a paper sheet are included in Figures 1 and 2. The motions of the belt 16, the first papermaker's wet press fabric 20, the second papermaker's wet press fabric 22, and the fibrous web 24 through the press nip 10 are upward in Figure 1. The belt 16 is disposed between the shoe 14 and press fabric 20 and thus has a shoe side and a felt side corresponding to the inner and outer surfaces, respectively. Lubricating means 26 in Figure 1 dispenses oil onto the side of belt 16 facing arcuate pressure shoe 14 to facilitate its sliding motion thereagainst.

[0032] Belt 10 includes a base comprising a plurality of non-overlapping turns of a spirally wound prepared structure strip. Figure 3 is a perspective view of an apparatus used for assembling the base. The apparatus 28 comprises a first roll 30 and a second roll 32, which are parallel to one another and which may be rotated in the directions indicated by the arrows. A prepared structure strip 34 is wound from a stock roll 36 and around first roll 30 and second roll 32 in a spiral. The stock roll 36 must be translated at a suitable rate along second roll 32 as the prepared structure strip 34 is being wound around the rolls 30,32.

[0033] A top plan view of the apparatus 28 is provided in Figure 4. The first roll 30 and the second roll 32 are separated by a distance D, which is determined with reference to the total length required for the belt 16 to be manufactured. Prepared structure strip 34, having a

width W, is spirally wound onto the first and second rolls 30,32 in a plurality of non-overlapping turns from stock roll 36, which is translated along second roll 32 in the course of the winding. Successive turns of the prepared structure strip 34 are abutted against one another, and are joined to one another by stitching or bonding along spirally continuous seam 38 to produce a base 40 as shown in Figure 5. When a sufficient number of turns of the prepared structure strip 34 have been made to make a base 40 of desired width W, the spiral winding is concluded. The base 40 so obtained has an inner surface, an outer surface, a longitudinal direction, and a transverse direction. The lateral edges of the base 40 will initially not be parallel to the longitudinal direction thereof, and may be trimmed along lines 42 to provide the base 40 with the desired width W, and with two lateral edges parallel to the longitudinal direction of its endless-loop form (see Figure 4).

[0034] Prepared structure strip 34 may be a fabric strip woven from yarns (for example, monofilament yarns) of a synthetic polymeric resin, such as polyester or polyamide, in the same manner as other fabrics used in the papermaking industry are woven. After weaving, it may be heat-set in a conventional manner prior to interim storage on stock roll 36. Such a fabric strip may include lengthwise yarns and crosswise yams, and may be of a single- or multi-layer weave. Because the fabric strip is spirally wound to assemble a woven base fabric, its lengthwise and crosswise yams do not align with the longitudinal and transverse directions, respectively, of the woven base fabric. Rather, the lengthwise yarns make a slight angle, θ, whose magnitude is a measure of the pitch of the spirally wound fabric strip, with respect to the longitudinal direction of the woven base fabric, as suggested by the top plan view of the base 40 shown in Figure 5.

[0035] Where the prepared structure strip 34 is a woven fabric strip, and, consequently, base 40 is a woven base fabric, the fabric strip is of a weave sufficiently open to permit complete impregnation thereof by the polymeric resin coating material. Complete impregnation eliminates the possibility of undesirable voids forming in the finished belt 16. Voids are particularly undesirable because they may allow the lubricating oil used between the belt 16 and the arcuate pressure shoe 14 to pass through the belt 16 and contaminate the press fabric 20, or press fabrics 20,22, and fibrous web 24 being processed into paper.

[0036] Alternatively, prepared structure strip 34 may be a non-woven fabric strip, a perforated synthetic strip, or a polymeric film strip.

[0037] A perspective view of belt 16 is provided in Figure 6. The belt has an inner surface 44 and an outer surface 46. On the outer surface 46, the base 40 and its spirally continuous seam 38 may be visible.

[0038] Figure 7 is a cross-section taken as indicated by line 7-7 in Figure 6 for the case where the prepared structure strip 34 is a fabric strip. The cross-section is taken lengthwise with respect to the fabric strip. Fabric strip 34 is woven from lengthwise yarns 48 and crosswise yarns 50 in a multi-layer weave. Knuckles 52 appearing on the fabric strip 34 where lengthwise yarns 48 weave over crosswise yams 50 may be visible on the outer surface 46 of the belt 16. The inner surface 44 of the belt 16 is formed by a polymeric resin coating 54.

[0039] The polymeric resin coating 54 is applied to at least one surface of the base 40, that surface being the one which will ultimately be the inner surface 44 of the belt 16. As the inner surface 44 slides across the lubricated arcuate pressure shoe 14, the polymeric resin coating 54 protects the base 40 from such sliding contact and the wear by abrasion that would otherwise result. The polymeric resin also impregnates the base 40 and renders the belt 16 impervious to oil and water. The polymeric resin coating 54 may be of polyurethane, and is preferably 100% solids composition thereof to avoid the formation of bubbles during the curing process through which the polymeric resin proceeds following its application onto the base 40. After curing, the polymeric resin coating 54 is ground and buffed to provide the belt 16 with a smooth surface and a uniform thickness.

[0040] In an alternative embodiment of the present invention, both surfaces of the woven base fabric 40 may be coated with a polymeric resin. Following the curing of the polymeric resin material, both the inner surface 56 and the outer surface 58 of belt 60, as shown in Figure 8, may be ground and buffed to provide the belt 60 with smooth surfaces and a uniform thickness. Finally, the outer surface 58 may be provided, by cutting, scoring or graving, with a plurality of grooves 62, for example, in the longitudinal direction around the belt 60, for the temporary storage of water pressed from fibrous web 24 in the press nip 10.

Claims

1. A belt for use on a long nip press of the shoe type for dewatering a fibrous web, said belt comprising:

   a base comprising a spirally wound prepared structure strip, said strip having a width smaller than a width of said base, said base being a plurality of non-overlapping turns of said spirally wound prepared structure strip, adjacent non-overlapping turns of said spirally wound prepared structure strip being abutted against one another and joined to one another, said base thereby having the form of an endless loop with an inner surface, an outer surface, a longitudinal direction and a transverse direction; and

   a coating of a polymeric resin on at least one of said inner and outer surfaces of said base, said coating impregnating and rendering said base impervious to liquids, said coating being

smooth and providing said belt with a uniform thickness.

2. A belt as claimed in claim 1 wherein said polymeric resin is polyurethane.

3. A belt as claimed in claim 1 or claim 2, wherein said prepared structure strip is a woven fabric strip, said strip being woven from lengthwise and crosswise yarns.

4. A belt as claimed in claim 3, wherein said fabric strip is a multi-layer fabric.

5. A belt as claimed in claim 3, wherein said fabric strip is a single-layer fabric.

6. A belt as claimed in any one of claims 3 to 5, wherein said lengthwise yarns and said crosswise yarns of said fabric strip are of a synthetic polymeric resin selected from the group consisting of polyester and polyamide resins.

7. A belt as claimed in claim 1 or claim 2, wherein said prepared structure strip is a non-woven fabric strip.

8. A belt as claimed in any one of claims 3 to 7, wherein said prepared structure strip is impregnated with said coating.

9. A belt as claimed in claim 1 or claim 2, wherein said prepared structure strip is a perforated synthetic strip.

10. A belt as claimed in claim 9, wherein said perforated synthetic strip is perforated with holes selected from the group consisting of round holes, square holes, chevron-shaped holes and diamond-shaped holes.

11. A belt as claimed in claim 1 or claim 2, wherein said prepared structure strip is a polymeric film strip.

12. A belt as claimed in any one of claims 1 to 11, wherein said base has two lateral edges, said two lateral edges being parallel to one another, aligned with said longitudinal direction of said base, and defining the width of said base.

13. A belt as claimed in any one of claims 1 to 12, wherein said adjacent turns are joined to one another by stitching.

14. A belt as claimed in any one of claims 1 to 12, wherein said adjacent turns are joined to one another by fibre entanglement.

15. A belt as claimed in any one of claims 1 to 12, wherein said adjacent turns are joined to one another by bonding.

16. A belt as claimed in claim 15, wherein said bonding is effected by ultrasonic welding.

17. A belt as claimed in claim 15, wherein said bonding is effected by heat fusion.

18. A belt as claimed in claim 15, wherein said bonding is effected by chemical bonding.

19. A belt as claimed in any one of claims 1 to 18, wherein said coating is provided on at least said inner surface of said base.

20. A belt as claimed in claim 19, further comprising a coating of a polymeric resin on said outer surface of said base, said coating being smooth and providing said belt with a uniform thickness.

21. A belt as claimed in claim 20, further comprising a plurality of grooves in said coating on said outer surface of said base.

22. A belt as claimed in claim 20 or claim 21, wherein said coating on said outer surface of said base is ground and buffed to give said belt a uniform thickness.

23. A belt as claimed in any one of claims 19 to 22, wherein said coating on said inner surface of said base is ground and buffed to give said belt a uniform thickness.

24. A papermaking machine including a long nip press provided with a belt as specified in any one of claims 1 to 23, said long nip press having a cylindrical press roll and an arcuate pressure shoe which together define a nip therebetween, said belt being passed through said nip in conjunction with at least one press fabric supporting and carrying said fibrous web to be dewatered between said press fabric and said arcuate pressure shoe.

25. A method for manufacturing a belt for a long nip press for dewatering a fibrous web comprising the steps of:

(a) manufacturing a prepared structure strip having a preselected width;
(b) spirally winding said prepared structure strip in a plurality of non-overlapping turns;
(c) abutting each turn of said prepared structure strip against that previously wound;
(d) joining each turn of said prepared structure strip to that previously wound to form a base of width greater than said preselected width of said prepared structure strip to provide a base

in the form of an endless loop having an inner surface, an outer surface, a longitudinal direction and a transverse direction;
(e) coating at least one of said inner and outer surfaces of said base with a polymeric resin to cover said base and to form a layer of said polymeric resin thereon to provide said belt with a desired thickness; and
(f) curing said polymeric resin.

26. A method as claimed in claim 25, wherein the prepared structure strip is as defined in any one of claims 3 to 12.

27. A method as claimed in claim 25 or claim 26, wherein said polymeric resin is polyurethane.

28. A method as claimed in any one of claims 25 to 27, further comprising the step of manufacturing a fabric strip for use as said prepared structure strip and heat-setting said fabric strip.

29. A method as claimed in any one of claims 25 to 28, wherein the step of spirally winding said prepared structure strip is performed by spirally winding said prepared structure strip about at least two parallel rolls.

30. A method as claimed in any one of claims 25 to 29, wherein the joining is as defined in any one of claims 13 to 18.

31. A method as claimed in any one of claims 25 to 30, further comprising the step of trimming said base to provide said base with lateral edges parallel to each other, aligned with said longitudinal direction of said base, and defining the width thereof.

32. A method as claimed in any one of claims 25 to 31, further comprising the step of grinding said cured polymeric resin to provide said belt with a smooth surface and a uniform thickness.

33. A method as claimed in any one of claims 25 to 32, wherein said inner surface of said base is coated with said polymeric resin material.

34. A method as claimed in claim 33, further comprising the step of coating said outer surface of said base with a second polymeric resin to form a layer of said second polymeric resin thereon to provide said belt with a desired thickness.

35. A method as claimed in claim 34, further comprising the step of curing said second polymeric resin.

36. A method as claimed in claim 35, further comprising the step of grinding said cured second polymeric resin to provide said belt with a smooth surface and a uniform thickness.

37. A method as claimed in claim 35 or claim 36, further comprising the step of providing a plurality of grooves in said cured second polymeric resin on said outer surface of said belt.

38. A method as claimed in any one of claims 34 to 37, wherein said second polymeric resin is polyurethane.

Patentansprüche

1. Band zur Verwendung auf einer Langspaltpresse des Schuhtyps zum Entwässern einer faserigen Bahn, wobei das Band

   eine Basis mit einem spiralförmig gewunden hergestellten Strukturstreifen, wobei der Streifen eine Breite besitzt, die kleiner als eine Breite der Basis ist, wobei die Basis mehrere nicht überlappende Windungen des spiralförmig gewunden hergestellten Strukturstreifens umfaßt, wobei benachbarte, nicht überlappende Windungen des spiralförmig gewunden hergestellten Strukturstreifens aneinanderstoßen und miteinander verbunden sind, wodurch die Basis die Form einer Endlosschleife mit einer Innenfläche, einer Außenfläche, einer longitudinalen Richtung und einer transversalen Richtung hat; und
   eine Beschichtung aus einem Polymerharz auf wenigstens einer der Innen- und Außenflächen der Basis, wobei die Beschichtung die Basis imprägniert und für Flüssigkeiten undurchlässig macht, wobei die Beschichtung glatt ist und dem Band eine gleichmäßige Dicke verleiht, umfaßt.

2. Band nach Anspruch 1, wobei das Polymerharz Polyurethan ist.

3. Band nach Anspruch 1 oder Anspruch 2, wobei der hergestellte Strukturstreifen ein gewebter Stoffstreifen ist, wobei der Streifen aus Längs- und Quergarnen gewebt ist.

4. Band nach Anspruch 3, wobei der Stoffstreifen ein mehrlagiger Stoff ist.

5. Band nach Anspruch 3, wobei der Stoffstreifen ein einlagiger Stoff ist.

6. Band nach einem der Ansprüche 3 bis 5, wobei die Längsgarne und die Quergarne des Stoffstreifens aus einem synthetischen Polymerharz gebildet

sind, das aus der aus Polyester- und Polyamidharzen bestehenden Gruppe gewählt ist.

7. Band nach Anspruch 1 oder Anspruch 2, wobei der hergestellte Strukturstreifen ein Vlies-Stoffstreifen ist.

8. Band nach einem der Ansprüche 3 bis 7, wobei der hergestellte Strukturstreifen mit der Beschichtung imprägniert ist.

9. Band nach Anspruch 1 oder Anspruch 2, wobei der hergestellte Strukturstreifen ein perforierter Synthetikstreifen ist.

10. Band nach Anspruch 9, wobei der perforierte Synthetikstreifen mit Löchern perforiert ist, die aus der Gruppe gewählt sind, die aus runden Löchern, quadratischen Löchern, zickzackförmigen Löchern und diamantförmigen Löchern besteht.

11. Band nach Anspruch 1 oder Anspruch 2, wobei der hergestellte Strukturstreifen ein Polymerfilmstreifen ist.

12. Band nach einem der Ansprüche 1 bis 11, wobei die Basis zwei Seitenkanten besitzt, die zueinander parallel sind, auf die Längsrichtung der Basis ausgerichtet sind und die Breite der Basis definieren.

13. Band nach einem der Ansprüche 1 bis 12, wobei die benachbarten Windungen durch Nähen miteinander verbunden sind.

14. Band nach einem der Ansprüche 1 bis 12, wobei die benachbarten Windungen durch Fadenverflechtung miteinander verbunden sind.

15. Band nach einem der Ansprüche 1 bis 12, wobei die benachbarten Windungen durch Haftung miteinander verbunden sind.

16. Band nach Anspruch 15, wobei die Haftung durch Ultraschallschweißen bewirkt ist.

17. Band nach Anspruch 15, wobei die Haftung durch Wärmeschmelzen bewirkt ist.

18. Band nach Anspruch 15, wobei die Haftung durch chemisches Haften bewirkt ist.

19. Band nach einem der Ansprüche 1 bis 18, wobei die Beschichtung wenigstens auf der Innenfläche der Basis vorgesehen ist.

20. Band nach Anspruch 19, ferner mit einer Beschichtung aus einem Polymerharz auf der Außenfläche der Basis, wobei die Beschichtung glatt ist und dem Band eine gleichmäßige Dicke verleiht.

21. Band nach Anspruch 20, ferner mit mehreren Rillen in der Beschichtung auf der Außenfläche der Basis.

22. Band nach Anspruch 20 oder Anspruch 21, wobei die Beschichtung auf der Außenfläche der Basis geschliffen und poliert ist, um dem Band eine gleichmäßige Dicke zu verleihen.

23. Band nach einem der Ansprüche 19 bis 22, wobei die Beschichtung auf der Innenfläche der Basis geschliffen und poliert ist, um dem Band eine gleichmäßige Dicke zu verleihen.

24. Papierherstellungsmaschine mit einer Langspaltpresse, die mit einem Band nach irgendeinem der Ansprüche 1 bis 23 versehen ist, wobei die Langspaltpresse eine zylindrische Preßwalze und einen gekrümmten Preßschuh besitzt, die zwischen sich zusammen einen Walzenspalt definieren, wobei das Band durch den Walzenspalt gemeinsam mit wenigstens einer Druckbahn, das die zwischen der Druckbahn und dem gekrümmten Preßschuh zu entwässernde faserige Bahn unterstützt und trägt, bewegt wird.

25. Verfahren zum Herstellen eines Bandes für eine Langspaltpresse zum Entwässern einer faserigen Bahn, mit den folgenden Schritten:

(a) Herstellen eines hergestellten Strukturstreifens mit einer im voraus gewählten Breite;
(b) spiralförmiges Wickeln des hergestellten Strukturstreifens in mehreren nicht überlappenden Windungen;
(c) Anstoßen jeder Windung des hergestellten Strukturstreifens an der vorher gewickelten Windung;
(d) Verbinden jeder Windung des hergestellten Strukturstreifens mit der vorher gewickelten Windung, um eine Basis mit einer Breite zu bilden, die größer als die im voraus gewählte Breite des hergestellten Strukturstreifens ist, um eine Basis in Form einer Endlosschleife mit einer Innenfläche, einer Außenfläche, einer longitudinalen Richtung und einer transversalen Richtung zu bilden;
(e) Beschichten wenigstens der Innen- oder der Außenfläche der Basis mit einem Polymerharz, um die Basis zu bedecken und um eine Lage aus dem Polymerharz darauf zu bilden, um dem Band eine gewünschte Dicke zu verleihen; und
(f) Härten des Polymerharzes.

26. Verfahren nach Anspruch 25, wobei der hergestellte Strukturstreifen wie in einem der Ansprüche 3 bis

12 definiert beschaffen ist.

27. Verfahren nach Anspruch 25 oder Anspruch 26, wobei das Polymerharz Polyurethan ist.

28. Verfahren nach einem der Ansprüche 25 bis 27, ferner mit dem Schritt des Herstellens eines Stoffstreifens, der als der hergestellte Strukturstreifen verwendet wird, und des Heißfixierens des Stoffstreifens.

29. Verfahren nach einem der Ansprüche 25 bis 28, wobei der Schritt des spiralförmigen Wickelns des hergestellten Strukturstreifens durch spiralförmiges Wickeln des hergestellten Strukturstreifens um wenigstens zwei parallele Walzen ausgeführt wird.

30. Verfahren nach einem der Ansprüche 25 bis 29, wobei das Verbinden wie in einem der Ansprüche 13 bis 18 definiert erfolgt.

31. Verfahren nach einem der Ansprüche 25 bis 30, ferner mit dem Schritt des Zurichtens der Basis, um die Basis mit Seitenkanten zu versehen, die zueinander parallel sind, auf die Längsrichtung der Basis ausgerichtet sind und deren Breite definieren.

32. Verfahren nach einem der Ansprüche 25 bis 31, ferner mit dem Schritt des Schleifens des gehärteten Polymerharzes, um dem Band eine glatte Oberfläche und eine gleichmäßige Dicke zu verleihen.

33. Verfahren nach einem der Ansprüche 25 bis 32, wobei die Innenfläche der Basis mit dem Polymerharzmaterial beschichtet ist.

34. Verfahren nach Anspruch 33, ferner mit dem Schritt des Beschichtens der Außenfläche der Basis mit einem zweiten Polymerharz, um darauf eine Lage des zweiten Polymerharzes zu bilden, um dem Band eine gewünschte Dicke zu verleihen.

35. Verfahren nach Anspruch 34, ferner mit dem Schritt des Härtens des zweiten Polymerharzes.

36. Verfahren nach Anspruch 35, ferner mit dem Schritt des Schleifens des gehärteten zweiten Polymerharzes, um dem Band eine glatte Oberfläche und eine gleichmäßige Dicke zu verleihen.

37. Verfahren nach Anspruch 35 oder Anspruch 36, ferner mit dem Schritt des Vorsehens mehrerer Rillen in dem gehärteten zweiten Polymerharz auf der Außenfläche des Bandes.

38. Verfahren nach einem der Ansprüche 34 bis 37, wobei das zweite Polymerharz Polyurethan ist.

Revendications

1. Bande destinée à être utilisée sur une presse à long pincement du type à sabot destinée à essorer une bande fibreuse, ladite bande comprenant :

   une base comprenant un ruban à structure préparée enroulé en spirale, ledit ruban présentant une largeur inférieure à une largeur de ladite base, ladite base étant formée par un grand nombre de tours ne se chevauchant pas dudit ruban à structure préparée enroulé en spirale, les tours adjacents ne se chevauchant pas dudit ruban à structure préparée enroulé en spirale étant placés bord à bord l'un contre l'autre et réunis l'un à l'autre, ladite base prenant ainsi la forme d'une boucle sans fin présentant une surface interne, une surface externe, une direction longitudinale et une direction transversale, et
   un revêtement d'une résine polymère sur au moins l'une parmi lesdites surfaces interne et externe de ladite base, ledit revêtement imprégnant ladite base et la rendant imperméable aux liquides, ledit revêtement étant lisse et dotant ladite bande d'une épaisseur uniforme.

2. Bande selon la revendication 1, dans laquelle ladite résine polymère est un polyuréthane.

3. Bande selon la revendication 1 ou la revendication 2, dans laquelle ledit ruban à structure préparée est un ruban d'étoffe tissée, ledit ruban étant tissé à partir de fils de base longitudinaux et transversaux.

4. Bande selon la revendication 3, dans laquelle ledit ruban d'étoffe est une étoffe multicouche.

5. Bande selon la revendication 3, dans laquelle ledit ruban d'étoffe est une étoffe monocouche.

6. Bande selon l'une quelconque des revendications 3 à 5, dans laquelle lesdits fils de base longitudinaux et lesdits fils de base transversaux dudit ruban d'étoffe sont faits d'une résine synthétique polymère sélectionnée parmi le groupe composé des résines de polyester et de polyamide.

7. Bande selon la revendication 1 ou la revendication 2, dans laquelle ledit ruban à structure préparée est un ruban d'étoffe non tissée.

8. Bande selon l'une quelconque des revendications 3 à 7, dans laquelle ledit ruban à structure préparée est imprégné dudit revêtement.

9. Bande selon la revendication 1 ou la revendication 2, dans laquelle ledit ruban à structure préparée est

un ruban synthétique perforé.

10. Bande selon la revendication 9, dans laquelle ledit ruban synthétique perforé est perforé de trous sélectionnés parmi le groupe composé de trous ronds, de trous carrés, de trous en forme de chevron et de trous en forme de losange.

11. Bande selon la revendication 1 ou la revendication 2, dans laquelle ledit ruban à structure préparée est un ruban de film polymère.

12. Bande selon l'une quelconque des revendications 1 à 11, dans laquelle ladite base présente deux bords latéraux, lesdits deux bords latéraux étant parallèles l'un à l'autre, alignés avec ladite direction longitudinale de ladite base, et définissant la largeur de ladite base.

13. Bande selon l'une quelconque des revendications 1 à 12, dans laquelle lesdits tours adjacents sont réunis l'un à l'autre par piquage.

14. Bande selon l'une quelconque des revendications 1 à 12, dans laquelle lesdits tours adjacents sont réunis l'un à l'autre par entremêlement de fibres.

15. Bande selon l'une quelconque des revendications 1 à 12, dans laquelle lesdits tours adjacents sont réunis l'un à l'autre par liaison.

16. Bande selon la revendication 15, dans laquelle ladite liaison est effectuée par soudage par ultrasons.

17. Bande selon la revendication 15, dans laquelle ladite liaison est effectuée par fusion par de la chaleur.

18. Bande selon la revendication 15, dans laquelle ladite liaison est effectuée par liaison chimique.

19. Bande selon l'une quelconque des revendications 1 à 18, dans laquelle ledit revêtement est appliqué sur au moins ladite surface interne de ladite base.

20. Bande selon la revendication 19, comprenant en outre un revêtement d'une résine polymère sur ladite surface externe de ladite base, ledit revêtement étant lisse et dotant ladite bande d'une épaisseur uniforme.

21. Bande selon la revendication 20, comprenant en outre un certain nombre de rainures dans ledit revêtement sur ladite surface externe de ladite base.

22. Bande selon la revendication 20 ou la revendication 21, dans laquelle ledit revêtement sur ladite surface externe de ladite base est poncé et poli afin de communiquer à ladite bande une épaisseur uniforme.

23. Bande selon l'une quelconque des revendications 19 à 22, dans laquelle ledit revêtement sur ladite surface interne de ladite base est poncé et poli afin de communiquer à ladite bande une épaisseur uniforme.

24. Machine de fabrication de papier comprenant une presse à long pincement munie d'une bande selon l'une quelconque des revendications 1 à 23, ladite presse à long pincement comportant un rouleau de presse cylindrique ainsi qu'un sabot de pression incurvé qui, ensemble, définissent un pincement entre ceux-ci, ladite bande étant passée au travers dudit pincement en combinaison avec au moins un feutre de presse supportant et transportant ladite bande fibreuse devant être essorée entre ledit feutre de presse et ledit sabot de pression incurvé.

25. Procédé de fabrication d'une bande pour presse à long pincement destinée à essorer une bande fibreuse comprenant les étapes consistant à :

(a) fabriquer un ruban à structure préparée présentant une largeur présélectionnée,
(b) enrouler en spirale ledit ruban à structure préparée en un grand nombre de tours ne se chevauchant pas,
(c) placer chaque tour dudit ruban à structure préparée bord à bord contre celui enroulé précédemment,
(d) réunir chaque tour dudit ruban à structure préparée à celui enroulé précédemment afin de former une base d'une largeur supérieure à ladite largeur. présélectionnée dudit ruban à structure préparée, afin d'obtenir une base sous la forme d'une boucle sans fin présentant une surface interne, une surface externe, une direction longitudinale et une direction transversale,
(e) revêtir au moins l'une parmi lesdites surfaces interne et externe de ladite base d'une résine polymère afin de recouvrir ladite base et de former une couche de ladite résine polymère sur celle-ci de manière à doter ladite bande d'une épaisseur souhaitée, et
(f) cuire ladite résine polymère.

26. Procédé selon la revendication 25, dans lequel le ruban à structure préparée est tel que défini dans l'une quelconque des revendications 3 à 12.

27. Procédé selon la revendication 25 ou la revendication 26, dans lequel ladite résine polymère est un polyuréthane.

28. Procédé selon l'une quelconque des revendications

25 à 27, comprenant en outre l'étape de fabrication d'un ruban d'étoffe destiné à être utilisé en tant que dit ruban à structure préparée, et de thermofixage dudit ruban d'étoffe.

29. Procédé selon l'une quelconque des revendications 25 à 28, dans lequel l'étape d'enroulement en spirale dudit ruban à structure préparée est exécutée en enroulant en spirale ledit ruban à structure préparée autour d'au moins deux rouleaux parallèles.

30. Procédé selon l'une quelconque des revendications 25 à 29, dans lequel la réunion est telle que définie dans l'une quelconque des revendications 13 à 18.

31. Procédé selon l'une quelconque des revendications 25 à 30, comprenant en outre l'étape consistant à rogner ladite base afin de doter ladite base de bords latéraux parallèles l'un à l'autre, alignés avec ladite direction longitudinale de ladite base, et définissant la largeur de celle-ci.

32. Procédé selon l'une quelconque des revendications 25 à 31, comprenant en outre l'étape de ponçage de ladite résine polymère cuite afin de doter ladite bande d'une surface lisse et d'une épaisseur uniforme.

33. Procédé selon l'une quelconque des revendications 25 à 32, dans lequel ladite surface interne de ladite base est revêtue dudit matériau de résine polymère.

34. Procédé selon la revendication 33, comprenant en outre l'étape de revêtement de ladite surface externe de ladite base avec une seconde résine polymère afin de former une couche de ladite seconde résine polymère sur celle-ci de manière à doter ladite bande d'une épaisseur souhaitée.

35. Procédé selon la revendication 34, comprenant en outre l'étape de cuisson de ladite seconde résine polymère.

36. Procédé selon la revendication 35, comprenant en outre l'étape de ponçage de ladite seconde résine polymère cuite afin de doter ladite bande d'une surface lisse et d'une épaisseur uniforme.

37. Procédé selon la revendication 35 ou la revendication 36, comprenant en outre l'étape de formation d'un certain nombre de rainures dans ladite seconde résine polymère cuite sur ladite surface externe de ladite bande.

38. Procédé selon l'une quelconque des revendications 34 à 37, dans lequel ladite seconde résine polymère est un polyuréthane.

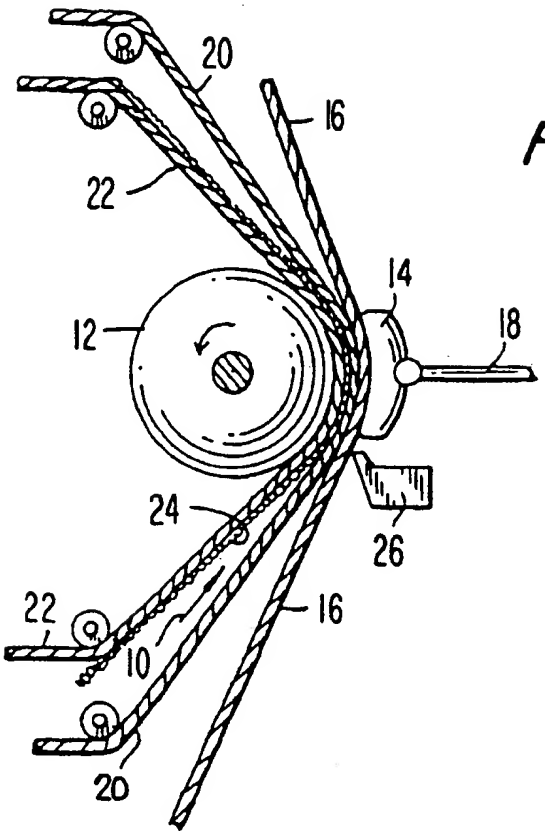

FIG. 1

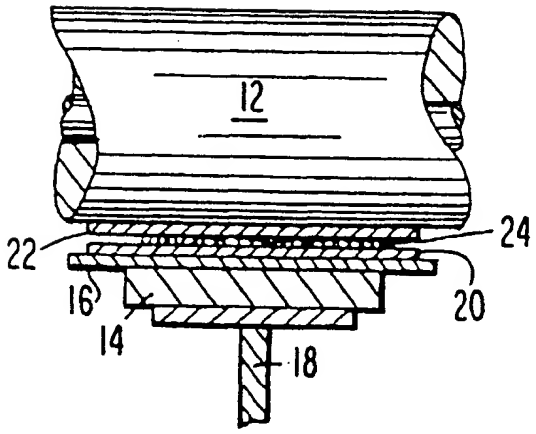

FIG. 2

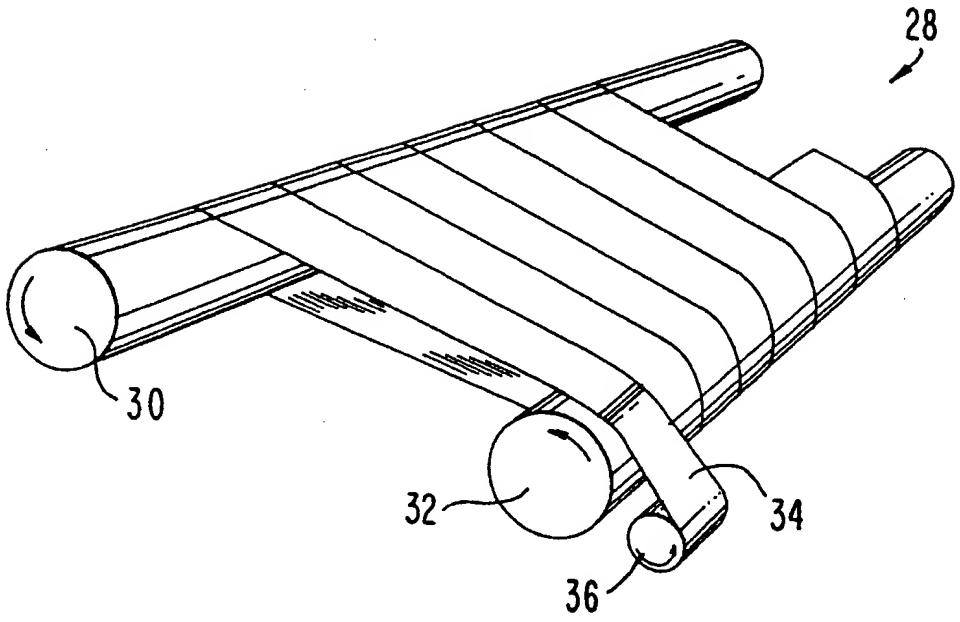

FIG. 3

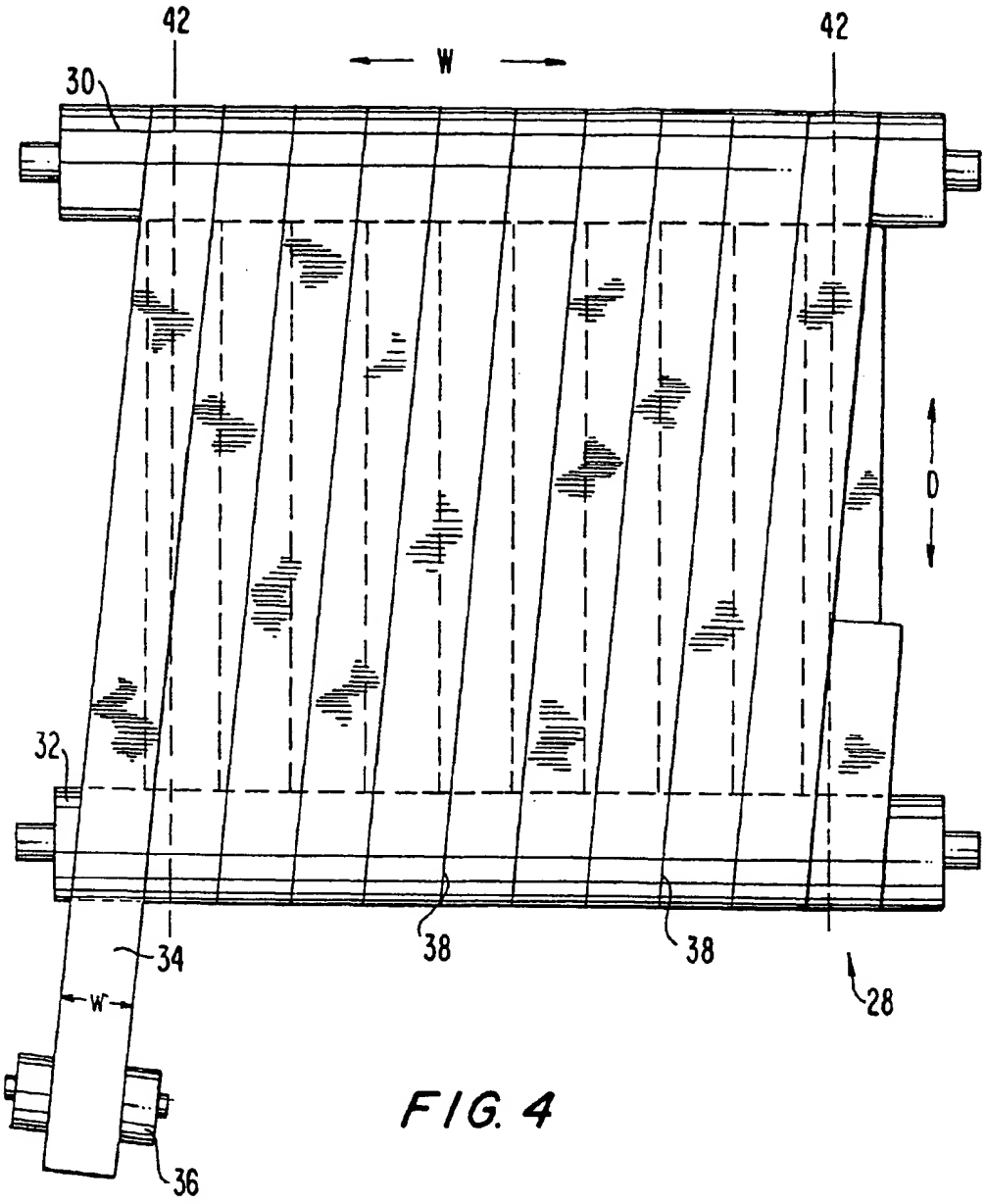

FIG. 4

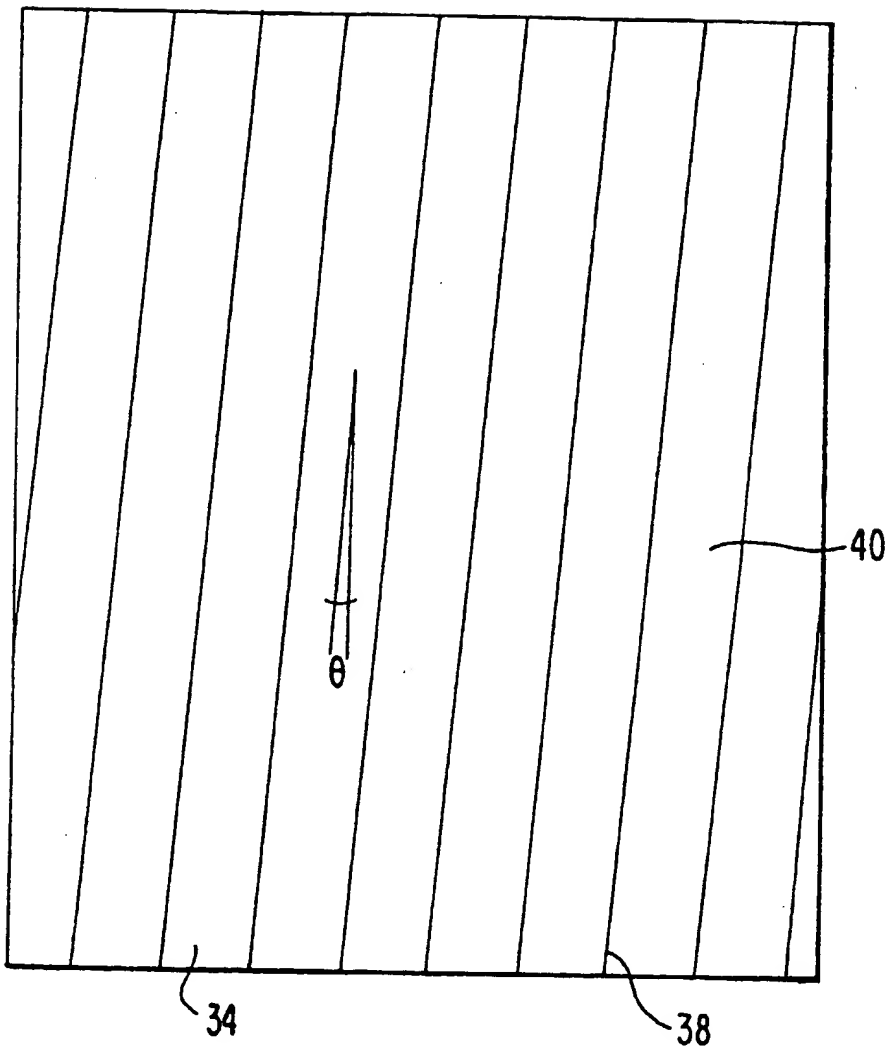

FIG. 5

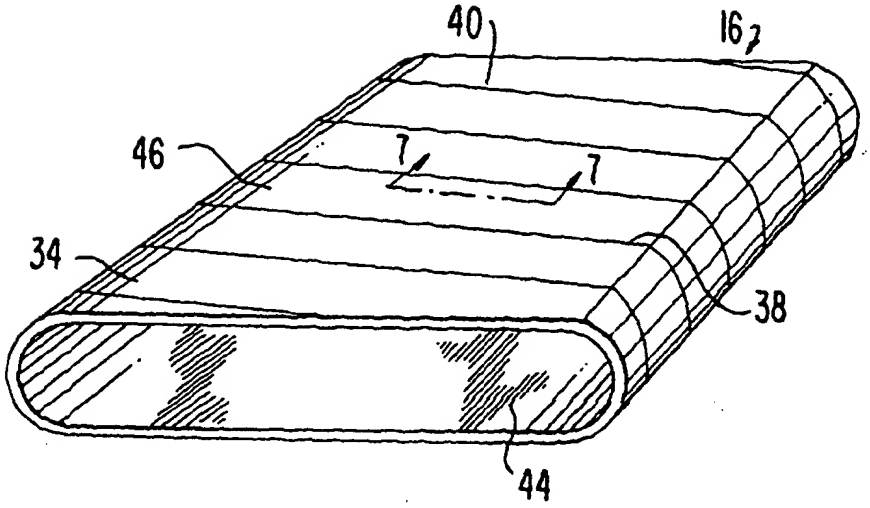

FIG. 6

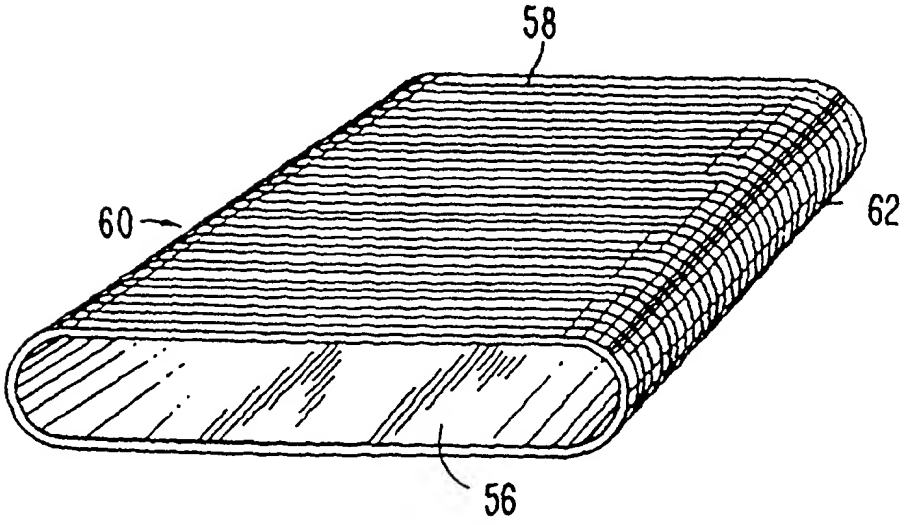

FIG. 8

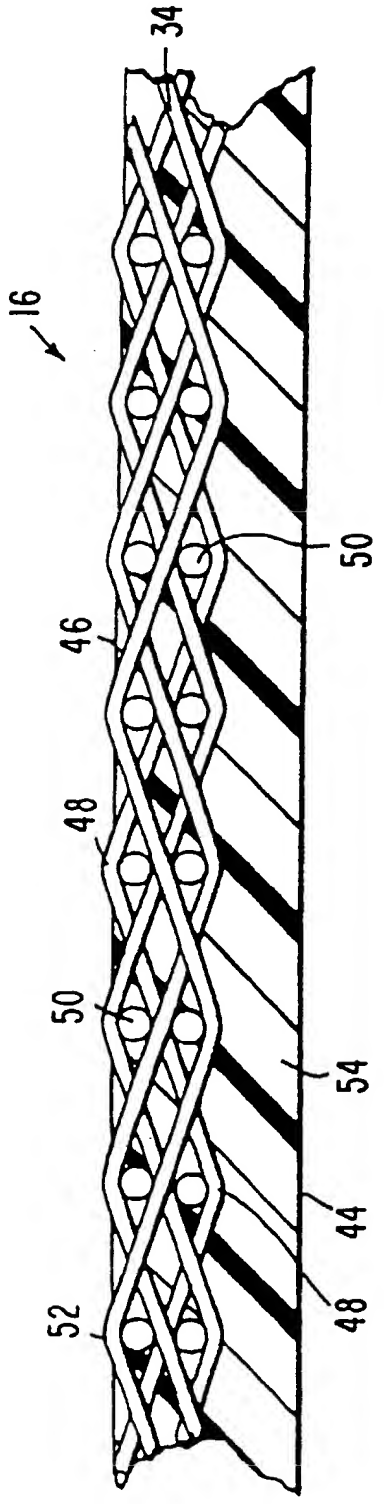

FIG. 7